Medical Evaluation
of the
Dental Patient

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Preoperative Assessment

“Never Treat a Stranger!”

<table>
<thead>
<tr>
<th>History</th>
<th>Physical Assessment</th>
<th>Medical Consultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medications</td>
<td>BP, HR, SPO₂</td>
<td>✓ Conditions of Concern</td>
</tr>
<tr>
<td>Allergies</td>
<td>Mentation</td>
<td>✓ Treatment Plan</td>
</tr>
<tr>
<td>Disease by system</td>
<td>ASA Physical Status</td>
<td>✓ Planned drugs/dosages</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td>Mallampati Airway</td>
<td>“Prepare for Conversation”</td>
</tr>
<tr>
<td>Anesthetic Experience</td>
<td>Class (if Sedation)</td>
<td></td>
</tr>
</tbody>
</table>

American Society of Anesthesiology

1 Healthy patient
2 Mild systemic disease. No significant impact on daily activity.
3 Significant or severe systemic disease. Significant impact on daily activity.
4 Severe disease that is a constant threat to life. Serious limitation of daily activity.

Duke Activity Status Index

The overall functional capacity of a patient is estimated based on a point scale derived using metabolic equivalents (MET) calculated as:

1 MET=3.5 mL/kg/min oxygen utilization


Allergy or Hypersensitivity

- Overreactive immune response to foreign antigen
- Four classes, but Type I most significant in acute drug reactions

✓ Most reactions are NOT immune mediated

Drug Exanthems

- A-C: Maculopapular rash
  - >80 of Reactions
  - Non-IgE and X-reactions unlikely
- D-E: Urticaria (Hives)
  - ~ 10% of Reactions
  - IgE mediated and X-reactions possible

Stern RS, NEJM 2012;366:2492-2501

Non-Immune Reactions

“Pseudoallergic”

- Direct histamine releasers: morphine, meperidine
- NSAIDs promote leukotriene synthesis

Drug Exanthems

- A-C: Maculopapular rash
- D-E: Urticaria (Hives)

Beta Lactam Antibiotics

- Cross-antigenicity related to R side chain

Beta Lactams with Similar R side chains

Penicillin  Cefoxitin (Meftoxin)
Amoxicillin  Cephalaxin (Keflex), Cefaclor (Ceclor)
Amoxicillin  Cefadroxil (Duricef), Cefprozil (Cefzil)

Medical Letter 2012;54:101
Penicillin Reactions

- Rate of cross-sensitivity ~0.1% if history is not IgE-mediated.

**Nature of reaction**

- **IgE:**
  - Hives/Anaphylactoid
  - No Beta Lactam
- **Non-IgE:**
  - Rash, Itch
  - Other PCN or Ceph Monitor 1st Dose
  - No Precaution
  - Nausea, Diarrhea, etc

Solenski R. J Allergy Clin Immunol 2012;130:1442
Medical Letter 2012;54:101

Macrolides

- **Checked Drug Interactions**

<table>
<thead>
<tr>
<th>Must Avoid</th>
<th>Use Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiretrovirals (all)</td>
<td>Ergotamine</td>
</tr>
<tr>
<td>Antiarhythmics (several)</td>
<td>Statins (all)</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>Theophylline</td>
</tr>
<tr>
<td>Digoxin</td>
<td>Valproic acid</td>
</tr>
</tbody>
</table>

- **Increasing Resistance among Dental Pathogens**
  - DeSimone DC, et al. Circulation June 2012
  - Olmstead County Minnesota 1999-2010
  - 150 cases of IE: (22 cases were VGS-IE)
    - ~95% susceptible to penicillin
    - ~71% susceptible to macrolides

Macrolides are resistant to erythromycin, clarithromycin, and azithromycin. Mandell’s Infectious Disease 2009

Fluoroquinolones

- **Inappropriate for Dental Infections!**

- Inhibit DNA replication
- Mostly Gram * Aerobic
- Newer Generations add Gram – and Anaerobes

Local Anesthetics

- There are no allergies to esters!
  - An ester is a ‘linkage’ and is not immunogenic
  - Ester local anesthetics are derived from PABA which IS immunogenic.

- Sulfites (-SO₃) are immunogenic but have no cross-relation to PABA or Sulfa antibiotics.

Local Anesthetic Allergy

- **Reported Allergy**
  - Question the Patient!
  - Allergic Symptoms
  - R/O Syncopal
  - R/O Epinephrine

- **Management**
  - Drug Known
    - Use alternate amide sans vasopressor
  - Drug Unknown
    - Allergy Referral
  - Lidocaine
    - 2.0% = 20 mg/mL
    - 0.5% = 5 mg/mL
  - Prilocaine
  - Mepivacaine
  - Does not have a vasopressor

- **Do You Know the Dose?**
  - Forget 1.7-1.8 mL Cartridges!
  - All contain ~2 mL!
  - Convert Cartridges to mL!
Epinephrine Considerations

- Maximum effects observed within 3-5 minutes and decline to baseline within 15-20 minutes
- “Contraindicated” only for hyperthyroidism
- Use “Caution” protocol if significant cardiovascular disease:
  - Baseline BP & Pulse
  - Reassess 5 minutes after each 20-40 micrograms

Assessing CAD Severity

<table>
<thead>
<tr>
<th>Canadian Cardiovascular Society Classification</th>
<th>Likely Lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Angina caused only by severe or prolonged exertion.</td>
<td>↑Degree of Stenosis</td>
</tr>
<tr>
<td>2 Angina on moderate effort such as walking uphill.</td>
<td></td>
</tr>
<tr>
<td>3 Angina with mild exertion resulting in marked limitation of ordinary activity; inability to walk two blocks or climb one flight of stairs.</td>
<td></td>
</tr>
<tr>
<td>4 Angina with almost any activity or may occur at rest.</td>
<td>Unstable Plaques</td>
</tr>
</tbody>
</table>

- Character and frequency of episodes: (NTG use?)
  - Reflects Lesion
- Resting Pulse and Blood Pressure: Reflects MVO₂

Stented Patients

- Delay elective treatment 6 weeks for bare-metal stents and 6 months for drug-eluting stents
- Patient may remain on antiplatelet therapy indefinitely


- No antibiotic prophylaxis indicated
### Medication Issues

<table>
<thead>
<tr>
<th>Drug / Class</th>
<th>Beneficial Effects</th>
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<tbody>
<tr>
<td>Beta Blockers</td>
<td>↓ HR, ↓ Contractility, ↓ MVO₂</td>
</tr>
<tr>
<td>CCBs</td>
<td>Vasodilation, ↓ MVO₂, ↓ HR *</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>Vasodilation ↓ preload (MVO₂)</td>
</tr>
<tr>
<td>Antiplatelet</td>
<td>Inhibit Thrombosis</td>
</tr>
</tbody>
</table>

- Beta Blockers and Epinephrine?
- CCBs and gingival hyperplasia?
- Antithrombotic drugs:
  - Drug interactions?
  - Postoperative bleeding?

### Beta Blockers - Epinephrine

- Vasopressor in local anesthetics may interact with nonselective agents, e.g., propranolol

- Sudden increase in MAP and reflex bradycardia

### Calcium Channel Blockers

- No significant interactions
- All implicated in gingival hyperplasia except isradipine (DynaCirc)

### Antithrombotic Drugs

- Primary component in arterial thrombosis ("White Clot")
- Target for antiplatelet drugs

- Primary component in venous thrombosis ("Red Clot")
- Target for anticoagulants

### Antiplatelet Drugs

<table>
<thead>
<tr>
<th>Antiplatelet Drugs</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin *</td>
<td>Inhibit TXA₂ Synthesis</td>
</tr>
<tr>
<td>Clopidogrel (Plavix)*</td>
<td>Inhibit ADP Receptor Activation</td>
</tr>
<tr>
<td>Prasugrel (Effient)*</td>
<td></td>
</tr>
<tr>
<td>Ticagrelor (Brilinta)</td>
<td></td>
</tr>
<tr>
<td>Dipryidamole (Persantine)</td>
<td>Lowers Ca²⁺ by elevating cAMP</td>
</tr>
<tr>
<td>Clostazol (Pletal)</td>
<td></td>
</tr>
<tr>
<td>Abciximab (ReoPro)</td>
<td>Block GPIb/IIa Receptors</td>
</tr>
<tr>
<td>Tirofiban (Aggrastat)</td>
<td></td>
</tr>
<tr>
<td>Eptifibatide (Integrilin)</td>
<td></td>
</tr>
</tbody>
</table>

* Permanent Inhibition
Coagulation

- Warfarin inhibits “Synthesis” of factors. (Delayed onset & Recovery)
- All others directly inhibit activity of “Existing” factors. (Immediate)

Oral Anticoagulants
- Warfarin (Coumadin) Inhibits “Synthesis” of Multiple Factors
- Dabigatran (Pradaxa) Inhibits “Activity” of IIa
- Rivaroxaban (Xarelto) Inhibits “Activity” of Xa

Parenteral Anticoagulants
- Heparin Inhibits “Activity” of Multiple Factors
- LMWH:
  - Enoxaparin (Lovenox)
  - Dalteparin (Fragmin) Inhibits “Activity” of Xa and IIa
- Fondaparinux (Arixtra) Inhibits “Activity” of Xa
- Bivalirudin (Angiomax) Inhibits “Activity” of IIa

INR only for Warfarin
(Monitored Q4–12 Wk)
- Prothrombin Time (PT) is a Ratio
  - If Normal = 12 sec & Patient = 18 sec
  - PT Ratio = 1.5
- Current Practice Converts PT to ‘INR’

Mechanical Mitral
Valves
Other Mechanical
Valves
Atrial Fibrillation
Primary MI
DVT

Suggested INRs
2.5-3.5
2-3

Antithrombotic Medications
- Warfarin
  - Macrolides / metronidazole elevate serum levels
- Antiplatelet Drugs
  - NSAIDs may inhibit ASA (Significance equivocal)
- Avoid NSAIDS for all antithrombotics
  - NSAIDS introduce greater risk for GI bleeding
  - Probably not a concern if patient is taking low-dose ASA

Antithrombotic Medications
Concerns for Postoperative Bleeding (?)

Bleeding Risk ?
Thrombosis Risk ?

- You must decide actual risk for bleeding
  - Little risk for routine extractions
  - For extensive procedures can they be divided over multiple appointments?
  - If your decision is to DC, MUST consult physician

- Physician must decide risk for thrombosis

Risk for Thromboembolism
- CHADS2 Scores
  - No interruption
    - Stroke or TIA within 3 months
    - CHADS2 5-6
    - Mechanical valve
    - Rheumatic valve disease

  - If OK to discontinue, what is timing?
    - Aspirin and clopidogrel: ~10% of platelets replenished daily
    - Warfarin: 48 hours to lose effect and 48 hours to re-establish effect.
Interruption of Antiplatelet Drugs

- Do not interrupt if for secondary prevention.
- If low risk (primary prevention) interrupt 7-10 days preoperatively.
- Stents (generally dual antiplatelet therapy: ASA + clopidogrel for 12 months):
  - Delay elective procedures 6 wk following bare-metal and 6 months following drug-eluting stents.
  - Do not interrupt antiplatelet drugs regardless of stent type.


Interruption of Anticoagulants

- Interruption of Warfarin:
  - Guidelines vary from 5 days preop for major surgery to no interruption for dermatologic and cataracts.
  - For dental: 2-3 days preop or no interruption (preferred).
  - Resumption 12-24 hr postop.
- Bridging with LMWH if high risk for thrombosis:
  - Last dose 24 hr rather than 12 hr preop.
  - Resumption 12-24 hr postop.
  - Resumption 48-72 hr if high bleeding risk.


Warfarin Management

- Know INR status: ≤ 3.5 generally acceptable for most treatment including scalings, injections and simple extractions.
  - How recent should value be assessed? Use judgement!
- Use judgement regarding mucosal flaps and more extensive procedures:
  - Segmental treatment rather than interrupting.
  - If convinced bleeding is a concern consult MD for possible adjustment or use of “Bridging”.

So-called “bridge-therapy” must be in consultation with and managed by the patient’s physician. This regimen limits the time patient is not anticoagulated to the perioperative period.

Exemplary Protocol:

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC warfarin 3-4 days preoperatively</td>
<td>Synthesis of renewed factors requires 3-4 days after warfarin discontinued.</td>
</tr>
<tr>
<td>Commence LMW heparin 3 days preoperatively</td>
<td>Provides anticoagulant effect as influence of warfarin declines.</td>
</tr>
<tr>
<td>Skip PM dose of LMW heparin night before surgery</td>
<td>Assures no anticoagulant influence at surgery.</td>
</tr>
<tr>
<td>Restart warfarin and LMW heparin PM on day of surgery or next morning</td>
<td>Anticoagulant effect commences immediately with LMW heparin.</td>
</tr>
<tr>
<td>Continue LMW heparin for 3 days postoperatively and check INR to confirm warfarin activity</td>
<td>Anticoagulant protection is provided by the LMW heparin while warfarin effects develop.</td>
</tr>
<tr>
<td>Discontinue LMW heparin when INR confirms warfarin activity</td>
<td></td>
</tr>
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Assessing CHF Severity

- Signs / Symptoms of Congestion:
  - Pulmonary: Dyspnea, Orthopnea
  - Systemic: Edema, Jugular Distention

- Resting Pulse and Blood Pressure: Reflects Cardiac Strain
**Medication Issues**

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<td>↓ HR, ↓ Contractility, ↓ MVO₂</td>
</tr>
<tr>
<td>ATII Inhibitors</td>
<td>Vasodilation, ↓ MVO₂, ↓ Na⁺/H₂O</td>
</tr>
<tr>
<td>Diuretics</td>
<td>↓ Na⁺/H₂O</td>
</tr>
<tr>
<td>Digoxin</td>
<td>↑ Contractility, ↓ HR</td>
</tr>
</tbody>
</table>

- Digoxin:
  - Avoid Macrolides/Tetracycline
  - Caution with epinephrine
- ACE Inhibitors:
  - Pseudoallergic side effects

**Primary Hypertension**

- Cause unknown
- Pathophysiology of Damage:
  - Atherosclerotic changes leading to stenosis and thrombosis
  - Pressure overloads the heart and damages target organs such as brain, kidney and retina
- Preoperative Assessment
  - Confirm Medication Compliance
  - End-organ Signs or Symptoms
  - Resting Pulse and Blood Pressure

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<td>↓ Na⁺/H₂O</td>
</tr>
</tbody>
</table>

- All increase risk for postural hypotension
- Avoid prolonged NSAID use (> 7 days) for patients taking any antihypertensive regimen, except CCBs
- Hold diuretic if lengthy appointment

**NSAIDs and Cardiovascular Disease**

- CAD: Concern is possible thrombosis due to prostanoid imbalance favoring platelet aggregation
  - NSAIDs inhibit Cyclooxygenases (COX-1 and COX-2)
    - Short-term ibuprofen (<7 days) probably OK

**JNC 7 JAMA 2003; 289:2560-72**

<table>
<thead>
<tr>
<th>Classifications</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Pre-hypertension</td>
<td>120-139</td>
<td>80-89</td>
</tr>
<tr>
<td>Stage 1</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>Stage 2</td>
<td>≥ 160</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>Stage 3</td>
<td>&gt;180</td>
<td>&gt;110</td>
</tr>
<tr>
<td>Stage 4</td>
<td>&gt;210</td>
<td>&gt;120</td>
</tr>
</tbody>
</table>

- Stage 1 and 2 (Up to: SBP 180 / DBP 110)
  - Generally OK to treat
- Former Stage 3 (SBP >180 / DBP >110)
  - Must consider other medical conditions
  - Delay if significant diabetes, CAD or CHF
- Former Stage 4 (SBP 210 / DBP 120)
  - Immediate referral

**Elective Procedures?**

- Stage 1 and 2 (Up to: SBP 180 / DBP 110)
  - Generally OK to treat
- Former Stage 3 (SBP >180 / DBP >110)
  - Must consider other medical conditions
  - Delay if significant diabetes, CAD or CHF
- Former Stage 4 (SBP 210 / DBP 120)
  - Immediate referral

**Fleisher LA. JAMA 2002;287(16):2043-6**

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  - Generally OK to treat
- Former Stage 3 (SBP >180 / DBP >110)
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  - NSAIDs inhibit Cyclooxygenases (COX-1 and COX-2)
    - Short-term ibuprofen (<7 days) probably OK
**NSAIDs and Cardiovascular Disease**
- Platelet issues were concern for CAD
- For CHF and HTN, renal issues are the concern.
- Prolonged use discouraged due to sodium retention and reduced efficacy of antihypertensive drugs
- Short-term use (<7 days) is OK


**Cardiac Arrhythmias**

*Irregularity in the normal rhythm of the heart*
- Many Causes:
  - Ischemic damage
  - Myocardial hypertrophy
  - Other
- Two Concerns:
  - Risk for conversion to lethal rhythm
  - May reduce cardiac output required to sustain blood pressure and perfusion

**Atrial Fibrillation**

- Many Causes:
  - Ischemic damage
  - Myocardial hypertrophy
  - Other
- Two Concerns:
  - Risk for conversion to lethal rhythm
  - May reduce cardiac output required to sustain blood pressure and perfusion

**Cardiac Pacemakers**

<table>
<thead>
<tr>
<th>Chamber Paced</th>
<th>Chamber Sensed</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>V (ventricle)</td>
<td>V (ventricle)</td>
<td>T (triggered or stimulated)</td>
</tr>
<tr>
<td>A (atrium)</td>
<td>A (atrium)</td>
<td>I (inhibited)</td>
</tr>
<tr>
<td>D (double or both)</td>
<td>D (double or both)</td>
<td>D (double or both)</td>
</tr>
<tr>
<td>O (none)</td>
<td>R (reverse)</td>
<td>O (none)</td>
</tr>
</tbody>
</table>

**Implantable Cardioverter Defibrillators**

- Sometimes erroneously shock supraventricular arrhythmias (8-40% of patients)
  - Conventional setting: 2.5 sec for HR >170
  - Errors reduced 77% if 2.5 sec for HR >200 (Moss AJ. NEJM 2012;367:2275-83)
  - ~$75, 000; replaced 5-7 years due to battery depletion

**Preoperative Assessment**

- History of dyspnea, chest pain or syncope
- Pacemaker Considerations:
  - Cautions for possible EMI include electrocautery, ultrasonic scalers & cleaners, and battery-powered curing lights
  - Consult regarding ICD’s; MD may wish to program off and restart after appointment.
  - No Antibiotic Prophylaxis Indicated
- Monitoring: Consider ECG & plethysmography via pulse oximeter
- Any syncopal episode requires support for hypotension and alert EMS.

Medication Issues

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<td>↓ HR and AV conduction</td>
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<tr>
<td>CCBs</td>
<td>↓ HR and AV conduction*</td>
</tr>
<tr>
<td>Digoxin</td>
<td>↓ HR and AV conduction</td>
</tr>
<tr>
<td>Amiodarone, et. al.</td>
<td>↓ electrical conduction by many actions</td>
</tr>
</tbody>
</table>

- Amiodarone: avoid macrolides and antifungals
- Always check interactions for any not listed above

Summary of Drug Concerns

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Dental Medication Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonselective Beta Blockers</td>
<td>Epinephrine: Sudden ↑ BP &amp; ↓ HR</td>
</tr>
<tr>
<td>ACE inhibitors</td>
<td>Angioedema</td>
</tr>
<tr>
<td>Calcium Blockers</td>
<td>Gingival Hyperplasia</td>
</tr>
<tr>
<td>All anti-HTN except Calcium Blockers</td>
<td>NSAIDs: Reduced efficacy if &gt; 5 days</td>
</tr>
<tr>
<td>All Antithrombotics</td>
<td>NSAIDs: Enhanced GI Bleeding</td>
</tr>
<tr>
<td>Warfarin (Coumadin)</td>
<td>Macrolides, Metronidazole (APAP ?): Increase warfarin levels (APAP may ↓ Vitamin K)</td>
</tr>
<tr>
<td>&quot;Statins&quot;</td>
<td>Macrolides: Hepatotoxicity/Myopathy</td>
</tr>
<tr>
<td>Digoxin</td>
<td>Macrolides, Tetracycline: Increase digoxin levels</td>
</tr>
</tbody>
</table>

Infective Endocarditis Prophylaxis

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa. (Circulation 2007)

1. Prosthetic cardiac valve
2. Previous IE
3. Cardiac transplantation recipients who develop cardiac valvulopathy
4. The following congenital heart diseases (CHD)
   a. Unrepaired cyanotic CHD, including palliative shunts and conduits
   b. Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure
   c. Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)

Use Common Sense !

[ Becker Opinion ]

325 page document. Numerous studies provide unequivocal evidence that bacteremias follow dental procedures. But no studies have found such bacteremias are associated with infection of orthopedic prostheses. Only 1 study published that addresses prophylaxis versus no prophylaxis in incidence of subsequent infections; This study found no relationship. (Berbari EF, et al. Clin Infect Dis 2016; 62(13):18-16.)

- Routine prophylaxis is unwarranted
- If prosthesis was replaced or required revision procedure prophylaxis is reasonable for periodontal scalings and any surgical procedure.

Respiratory Disease

<table>
<thead>
<tr>
<th>Pathogenesis</th>
<th>Asthma</th>
<th>Chronic Bronchiolitis</th>
<th>Emphysema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergic inflammation / Hyperresponsiveness</td>
<td>Non-allergic inflammation</td>
<td>Alveolar wall destruction</td>
<td></td>
</tr>
<tr>
<td>Histopathology</td>
<td>Smooth muscle hyperplasia / Mucus production</td>
<td>Hyperplasia of mucus glands / Wall thickening from infiltrate</td>
<td>Decreased surface area &amp; elasticity</td>
</tr>
</tbody>
</table>
Assessment & Management

- Record Baseline SpO₂ on Room Air.
- SpO₂ <90 Medical Consult!
- Document Triggers for Exacerbations.
- Assess Frequency of Dyspnea and Orthopnea.
- Safe to Oxygenate COPD to SpO₂ >90.
- Always have albuterol available

Diabetes Mellitus

“A group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.”

- Type 1: (Formerly Type I, IDDM)
  - Insulin deficiency is complete.
- Type 2: (Formerly Type II, NIDDM)
  - Insulin production is inadequate and body tissues appear resistant.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Prediabetes</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting Plasma Glucose</td>
<td>100-125 mg/dL</td>
<td>&gt;126 mg/dL</td>
</tr>
<tr>
<td>Oral Glucose Tolerance</td>
<td>140-199 mg/dL</td>
<td>≥200 mg/dL</td>
</tr>
<tr>
<td>Random Plasma Glucose</td>
<td>≥140 mg/dL</td>
<td>≥200 mg/dL</td>
</tr>
<tr>
<td>Glycated Hemoglobin</td>
<td>5.7-6.4%</td>
<td>≥6.5%</td>
</tr>
</tbody>
</table>

End-Organ Consequences

- Angiopathies
- Neuropathies
- Retinopathy
- Renal Failure

Preoperative Assessment

- Status of Control
  - Medication Adjustments/Hospitalizations
  - Symptoms of End-Organ Complications
  - Best Indicator is HbA₁c
  - Hypoglycemic Episodes

- Risk for infection and delayed healing: antibiotics (?)
- Remember that glucocorticoids elevate serum glucose

Medication Issues

<table>
<thead>
<tr>
<th>Drug / Class</th>
<th>Beneficial Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta₂ Agonists</td>
<td>Bronchodilation*</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Bronchodilation*</td>
</tr>
<tr>
<td>Theophylline</td>
<td>Some bronchodilation but mostly ↑ inspiratory muscle strength</td>
</tr>
<tr>
<td>Steroids &amp; LTE antagonists</td>
<td>↓ inflammation</td>
</tr>
</tbody>
</table>

- Theophylline: avoid macrolides
- Steroids: Consider adrenal suppression and immunosuppression

Medication Issues

<table>
<thead>
<tr>
<th>Hypoglycemics</th>
<th>Anti-hyperglycemics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulins</td>
<td>Metformin (Glucophage)</td>
</tr>
<tr>
<td>Glimepiride (Amaryl)</td>
<td>Pioglitazone (Actos), Rosiglitazone (Avandia)</td>
</tr>
<tr>
<td>Glyburide (Micronase)</td>
<td>Acarbose (Precose), Miglitol (Glyset)</td>
</tr>
<tr>
<td>Glipizide (Glucotrol)</td>
<td>Both Actions</td>
</tr>
<tr>
<td>Repaglinide (Prandin)</td>
<td>Sitagliptin (Januvia), Linagliptin (Tradjenta)</td>
</tr>
<tr>
<td>Nateglinide (Starlix)</td>
<td>Exenatide (Byetta), Lisinopril (Victoza)</td>
</tr>
</tbody>
</table>

- No significant interactions
- If NPO:
  - Hold oral hypoglycemics
  - Have patient consult MD for insulin
  - OK to take anti-hyperglycemics
Chronic Renal Failure

- Irreversible, progressive deterioration of glomerular filtration, tubular reabsorption, and endocrine functions of the kidneys
- Diabetes and hypertension leading causes

GFR (mL/min)

<table>
<thead>
<tr>
<th>Serum Creatinine (mg/dL)</th>
<th>GFR (mL/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>120</td>
</tr>
</tbody>
</table>

- Severe: Renal failure
- Moderate: Renal Insufficiency
- Mild: Loss of renal reserve

ESRD: Uremia

- Uremia reflects the constellation of systemic complications attributed chronic renal failure
- These appear when azotemia becomes significant

<table>
<thead>
<tr>
<th>Body System</th>
<th>Manifestations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematologic</td>
<td>Anemia, bleeding tendencies, immunocompromise</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Hypertension, CHF, pulmonary edema, arrhythmias</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Anorexia, nausea, vomiting, GI bleeding</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>Muscle weakness, bone pain, spontaneous fractures</td>
</tr>
<tr>
<td>Neurologic</td>
<td>Headache, anorexia, lethargy, delirium, coma, seizures</td>
</tr>
<tr>
<td>Body fluids</td>
<td>Metabolic acidosis, hyperkalemia, hypocalemia</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>Impotence, amenorrhea, loss of libido,</td>
</tr>
</tbody>
</table>

Dialysis Patients

(mild-moderate disease generally not a concern)

- Confirm labs with nephrologist
- Avoid arteriovenous fistula (shunt)
  - Alternate arm for BP cuff & venipuncture
  - Antibiotic prophylaxis if I&D of abscess
- Schedule day following dialysis
- Blood Cell Issues
  - Anemia: reduced erythropoietin
  - Platelet dysfunction and thrombocytopenia; especially with dialysis
- Consider Degree of Immunocompromise
- Reduction in Antibiotic Dosages

ESRD: Dosage Considerations

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Normal</th>
<th>Dosage Adjustment</th>
<th>Supplemental dose indicated following dialysis.</th>
</tr>
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<tbody>
<tr>
<td>Amoxicillin</td>
<td>500mg TID</td>
<td>500mg QD</td>
<td></td>
</tr>
<tr>
<td>Cephalexin</td>
<td>500mg QID</td>
<td>500mg QD</td>
<td></td>
</tr>
<tr>
<td>Metronidazole</td>
<td>500mg TID</td>
<td>250mg TID</td>
<td></td>
</tr>
</tbody>
</table>

Liver Disease

- Coagulation Issues
  - Thrombocytopenia secondary to splenomegaly from portal hypertension
  - Reduced synthesis of both procoagulant and anticoagulant factors
  - Factor imbalance may result in hemorrhage as well as thrombosis; Coagulation tests (INR & PTT) are unreliable as predictors for hemorrhage.
  - Labs: Maybe platelet count and INR (Little 2013)
- Caution with APAP
- Empiric Reduction in Dosages for Drugs Cleared Hepatically

ESRD: Dosage Considerations

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</tr>
</tbody>
</table>

Geriatric Patients

Age-Related Changes | Consideration |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td></td>
</tr>
<tr>
<td>Vessel elasticity</td>
<td>Increased BP (SBP &gt; DBP)</td>
</tr>
<tr>
<td>Cardiac output</td>
<td>Systemic and pulmonary congestion</td>
</tr>
<tr>
<td>Baroreceptor sensitivity, pacemaker tissues &amp; adrenergic innervation</td>
<td>Bradycardias and orthostatic hypotension</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Reduced PaO₂</td>
</tr>
<tr>
<td>Elasticity leads to alveolar distension and small airway collapse (V/Q mismatch)</td>
<td></td>
</tr>
<tr>
<td>Respiratory drive and muscle strength</td>
<td>Hypoventilation</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>LES tone &amp; gastric emptying</td>
<td>Emesis &amp; regurgitation more likely</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>Reduce treatment time</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>Charn position and time</td>
</tr>
<tr>
<td>Renal/Hepatic function</td>
<td>Drug dosage considerations</td>
</tr>
</tbody>
</table>

Brockmann W, Badr M. JADA 2010;141(11):1330-9
Little JW, et al. 2013
**Geriatric Summary**

- Keep patient warm
- Consider comfort; avoid treatment > 2 hr
- Choose drugs having shorter half-lives
- Greater risk for GI toxicity from NSAIDS
- If Sedation:
  - More likely to experience delirium
  - Avoid Antihistamines (Dementia)
  - Reduce increments of CNS depressants by 50%
  - Expect slower recovery from sedation
  - Cautious ambulation
  - Discharge to “vested” escort

**Antiresorptive Agent-Induced Osteonecrosis of Jaw (ARONJ)**

- **Diagnostic Criteria**
  - Exposed bone for > 8 weeks
  - Exposure to bisphosphonates
  - No history of radiation therapy
- **Bisphosphonate Risk Factors**
  - IV for cancer most significant; PO for osteoporosis very low
  - Duration: > 2 years for IV but PO unclear
  - Poor Periodontal Health
  - Tooth Abscesses

**BIOJ Incidence January 2003-September 2009**

- 2408 total cases: 88% IV (primarily zoledronate)
- 1780 cases had indication identified
  - Malignancy 99% Osteoporosis 10%.
- 1694 cases had drug identified with 12% PO
  - Alendronate (Fosamax) or ibandronate (Boniva)
- 1570 cases identified precipitating event; mostly extractions


**Pathogenesis is Poorly Understood**

- Bisphosphonates inhibit osteoclast activity
  - Trigger apoptosis
  - Inhibit function in those that survive
- Bone becomes more mineralized, but less cellular and vascular.
- ONJ resembles osteopetrosis
  - If infection occurs, no vascularity for inflammation and repair.
  - Jaws more susceptible than other bones because they are normally more vascular, remodel more and at constant risk for odontogenic and periodontal infection.
- Bone necrosis may not be the primary insult
  - Bisphosphonates released by osteoclasts may inhibit healing of oral mucosa and promote secondary infection, including osteomyelitis.

**ADA Guidelines**

**Managing the care of patients receiving antiresorptive therapy for prevention and treatment of osteoporosis.**

Executive summary of recommendations from the American Dental Association Council on Scientific Affairs

John W. Hellstein, DDS, MS; Robert A. Adler, MD; Beatrice Edwards, MD; Peter L. Jacobsen, PhD, DDS; John R. Kalmar, DMD, PhD; Sreenivas Koka, DDS, PhD; Cesar A. Migliorati, DDS, MS, PhD; Helen Ristic, PhD; for the American Dental Association Council on Scientific Affairs Expert Panel on Antiresorptive Agents

**Summary and Recommendations**

- Encourage physicians and patients to attain healthy oral status prior to commencing therapy
- Risk is very low if ≤ 2 years therapy
  - Chlorhexidine rinses advised for surgical procedures
  - For extensive treatment use trial segmental treatment plan to evaluate healing
- Risk remains low but increases as treatment exceeds 2 years
  - No proven value for “drug holidays”
  - No proven value of tests for risk assessment
**Surgical Considerations**

- No procedure is contraindicated, including implants.
- For extensive treatment use trial segmental treatment plan to evaluate healing.
- Attempt primary tissue closure if possible. Otherwise consider semipermeable membranes over extraction sites.
- Chlorhexidine rinses advised before and after surgery until healing confirmed, e.g., BID x 4-8 weeks.
- Antibiotics: preop and 3-7 days postop.

**Maternal Considerations**

- Serum glucose status.
- Preoperative blood pressure.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational Hypertension</td>
<td>BP ≥140/90 / No proteinuria</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>Possible: BP ≥140/90 / + proteinuria</td>
</tr>
<tr>
<td></td>
<td>Likely: BP ≥160/110 / ++ proteinuria</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>Seizures and Preeclampsia</td>
</tr>
</tbody>
</table>

- Prevent Hypotension: Uterine displacement (2nd-3rd trimester).
- Avoid nausea.

**Physiological Changes**

<table>
<thead>
<tr>
<th>Cardiovascular</th>
<th>Respiratory</th>
<th>GI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Volume +35%</td>
<td>O₂ Consumption +20-50%</td>
<td>↑ Gastric Acidity</td>
</tr>
<tr>
<td>Cardiac Output +40%</td>
<td>Minute Ventilation +50%</td>
<td>↓ GI Motility</td>
</tr>
<tr>
<td>Heart Rate +20%</td>
<td>PaO₂ +10%</td>
<td>LES Incompetence</td>
</tr>
<tr>
<td>↓ SVR</td>
<td>SBP -5%</td>
<td>PaCO₂ -15%</td>
</tr>
<tr>
<td>DBP -15%</td>
<td>FRC -20%</td>
<td></td>
</tr>
</tbody>
</table>

Glucose: Mild fasting hypoglycemia but generally insulin resistance and hyperglycemia.

**Fetal Considerations**

- Avoid Umbilical Arterioconstriction.
- Maternal Hyperventilation.
- High Doses Vasoconstrictors.

- Use of Medications:
  - Risks for teratogenicity often overstated, especially short-term use.
  - FDA classes (A thru X) are guidelines but often lack sound scientific data.

**Categories for Typical Drugs**

(Derived from Donaldson & Goodchild. JADA 2012 143:858-71.)

<table>
<thead>
<tr>
<th>Drug Category</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Analgesics</td>
<td>Sedatives</td>
</tr>
<tr>
<td>APAP &amp; Oxycodeine</td>
<td>B</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>C</td>
</tr>
<tr>
<td>NSAIDS</td>
<td>C/D</td>
</tr>
<tr>
<td>Local Anesthetics *</td>
<td>Antibiotics</td>
</tr>
<tr>
<td>Articaine/Bupivacaine/ mepivacaine</td>
<td>C</td>
</tr>
<tr>
<td>Lidocaine/Prilocaine</td>
<td>B</td>
</tr>
</tbody>
</table>

* W or W/O vasopressors

**The Pregnant Patient**

"It is generally agreed that only emergency surgery should be performed during pregnancy, particularly in the first trimester."

- Patients apprehension should be allayed by sedation and premedication.
- Pain should be relieved whenever present.
- Avoid maternal hyperventilation.
- Provide uterine displacement 2nd-3rd trimester.
- Choose drugs with long history of safety:
  - Thiopental
  - Morphine, meperidine
  - Muscle relaxants

- Low Concentrations of Nitrous Oxide

Drugs administered should be chosen for their known safety in pregnancy. Such agents include thiopental, depolarizing and non-depolarizing muscle relaxants, opioids (fentanyl, morphine, and meperidine), inhaled agents, and 50:50 O₂/N₂O mixtures. Maternal PaCO₂ should be maintained in the normal range for pregnancy (30 mm Hg) because maternal hyperventilation may reduce placental blood flow.

“Available studies suggest, for a surgical procedure, that administration of nitrous oxide or volatile, opioid, regional, or local anesthetics to a pregnant woman will not have deleterious effects on embryonic or fetal development and lack clinical significance for adverse neonatal outcome.”

“The addition of dilute concentrations of epinephrine to local anesthetic solutions does not appreciably alter uterine blood flow.”

Available studies suggest, for a surgical procedure, that administration of nitrous oxide or volatile, opioid, regional, or local anesthetics to a pregnant woman will not have deleterious effects on embryonic or fetal development and lack clinical significance for adverse neonatal outcome.

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Defer Elective Treatment

If Treatment is Required:
- Uterine displacement & Monitor BP
- Local Anesthetics are OK
- Epinephrine is OK
- Codeine derivatives and APAP are OK
- Most Antibiotics are OK

If Severe Apprehension:
- N₂O is OK
- PRN: add zolpidem PO or midazolam IV

Drug Effect

<table>
<thead>
<tr>
<th>Drug</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticholinergics</td>
<td>Meconium Ileus</td>
</tr>
<tr>
<td>NSAIDS</td>
<td>Closed Ductus Arteriosus, Necrotizing Enterocolitis</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Neonatal Withdrawal; No Clefts !</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>Tooth/Bone Abnormalities</td>
</tr>
</tbody>
</table>

The addition of dilute concentrations of epinephrine to local anesthetic solutions does not appreciably alter uterine blood flow.

Established Fetal Influences

- Defer Elective Treatment
- If Treatment is Required:
  - Uterine displacement & Monitor BP
  - Local Anesthetics are OK
  - Epinephrine is OK
  - Codeine derivatives and APAP are OK
  - Most Antibiotics are OK
- If Severe Apprehension:
  - N₂O is OK
  - PRN: add zolpidem PO or midazolam IV

2-5% of Drug Elimination

Breast Feeding

- Store Milk if Sedation Planned
- Avoid Prolonged Opioid Use